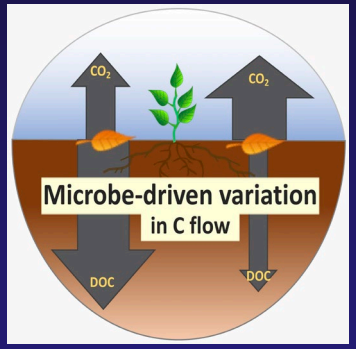
LA-UR-21-27975
Approved for public release; distribution is unlimited.

Title: Microbial Carbon Cycling in Terrestrial Ecosystems Phase V: Mechanisms that create and maintain microbially-driven variation in carbon fate

Author(s): Sevanto, Sanna Annika

Intended for: SFA renewal defence

Issued: 2021-08-10



Microbial Carbon cycling in Terrestrial Ecosystems:

Phase V: Mechanisms that create and maintain microbially-driven variation in carbon fate

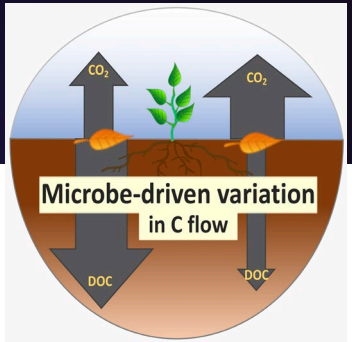
Objective 3

Sanna Sevanto

August 17, 2021

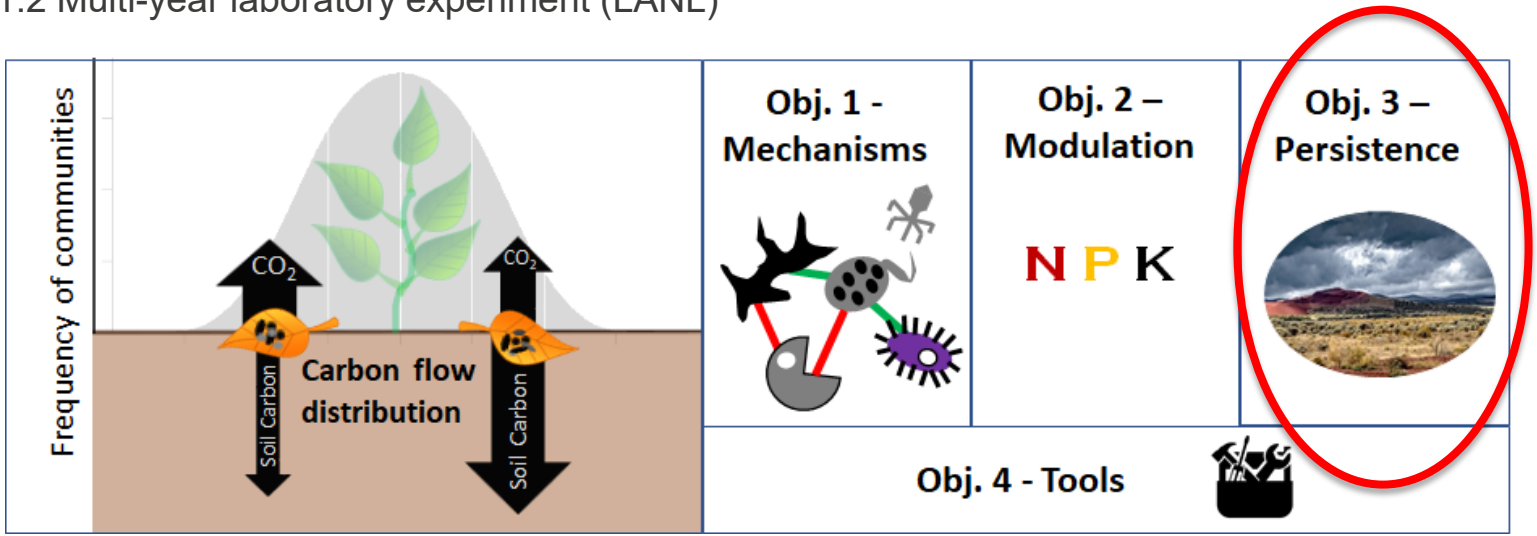
LA-UR

Objective 3: Manipulating C flow in natural systems
(Sanna Sevanto, LANL)

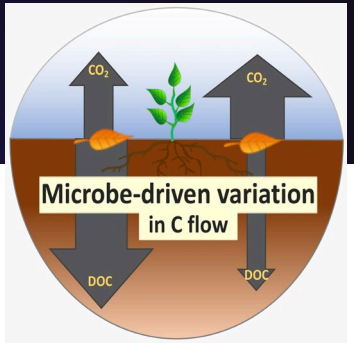


- **Understanding temporal dynamics of microbial driven surface litter decomposition, and how microbial phenotype can be controlled**

- **Tasks**
  1) 3.1.1 Multi-year field experiment (LANL)
  2) 3.1.2 Multi-year laboratory experiment (LANL)



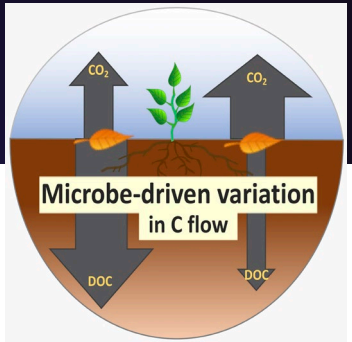
Motivation: What did we learn in Phase IV



12-month field experiment with litter “traps”

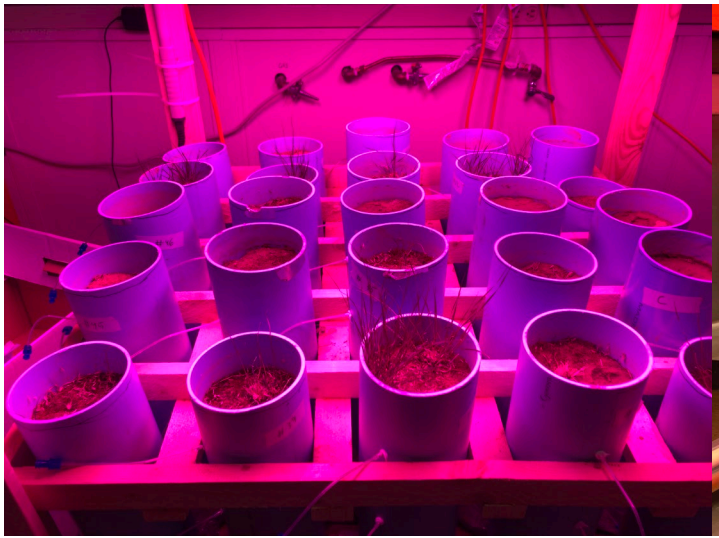
-How does microbial driven surface litter decomposition behave in variable climatic conditions in the field?

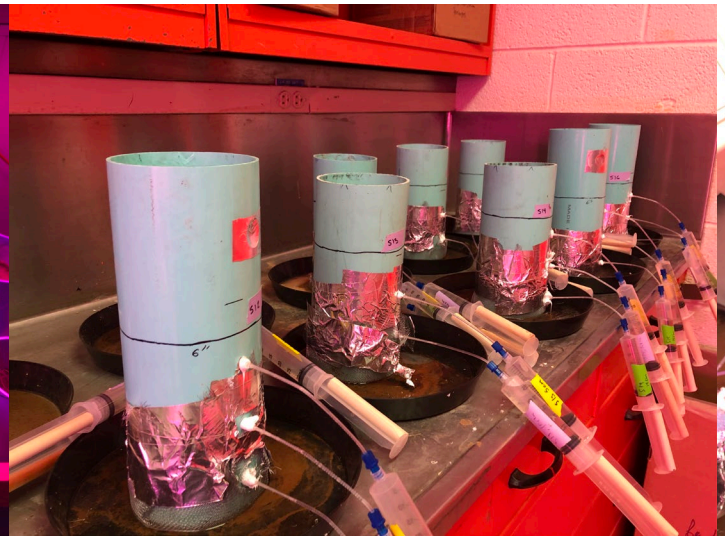
Motivation: What did we learn in Phase IV



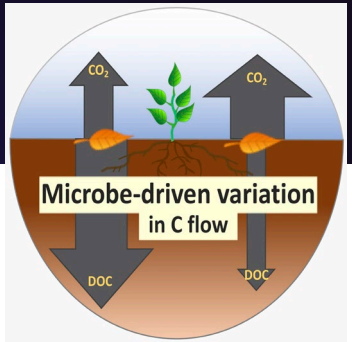
Two generation test with natural soil cores

-Does microbial driven surface litter decomposition make a difference in carbon cycling on natural soil and with plants?

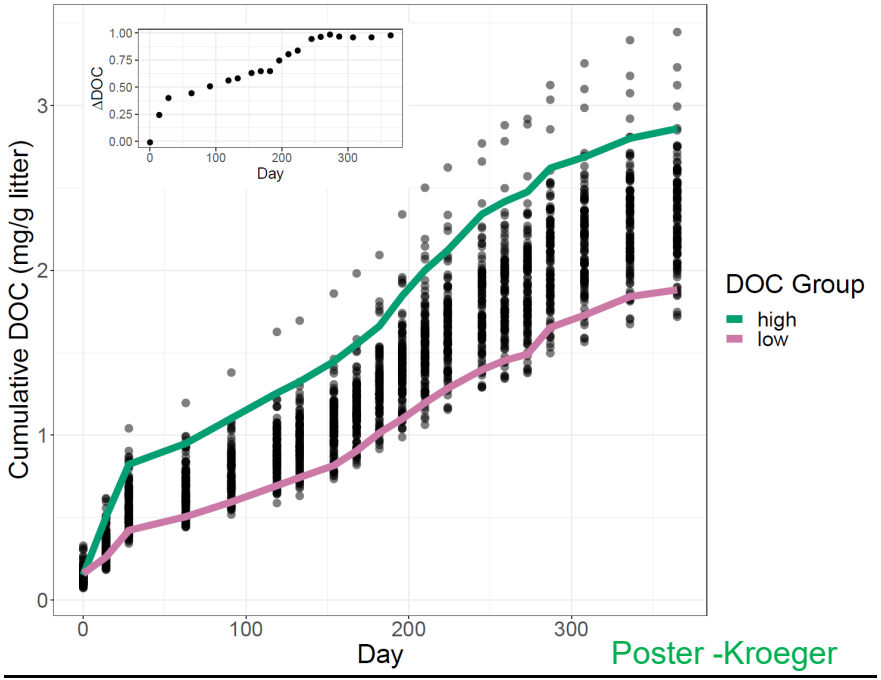




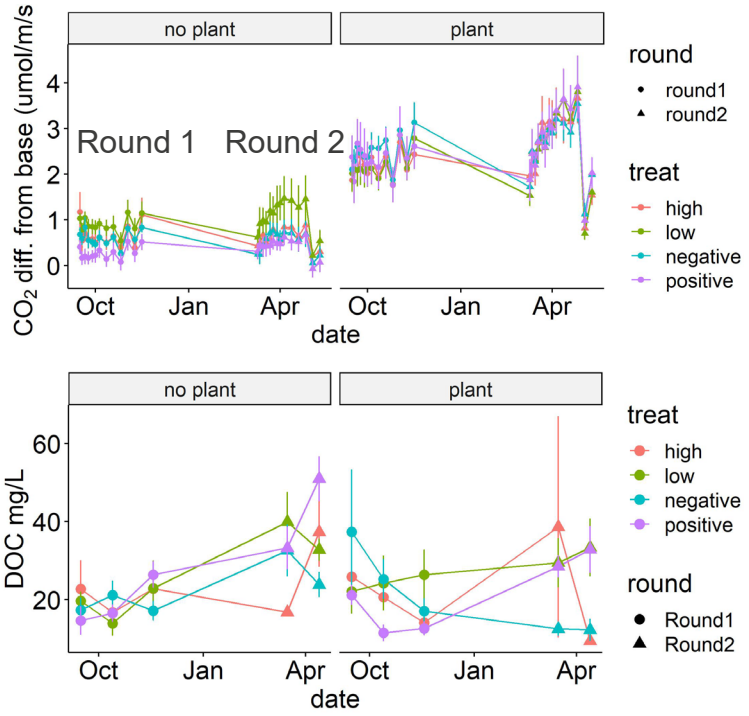
Motivation: What did we learn in Phase IV



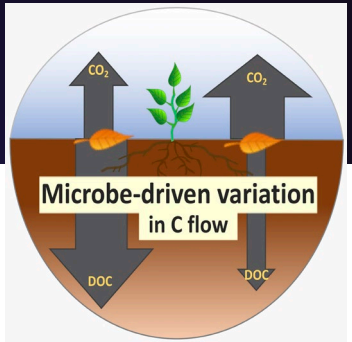
- Surface litter decomposition **can change C cycling in variable field conditions** as well as on natural soil
- The initial microbiome phenotype is not always maintained



Poster -Kroeger

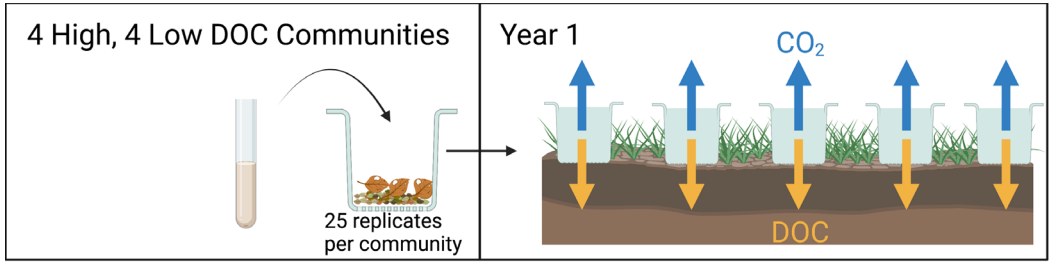


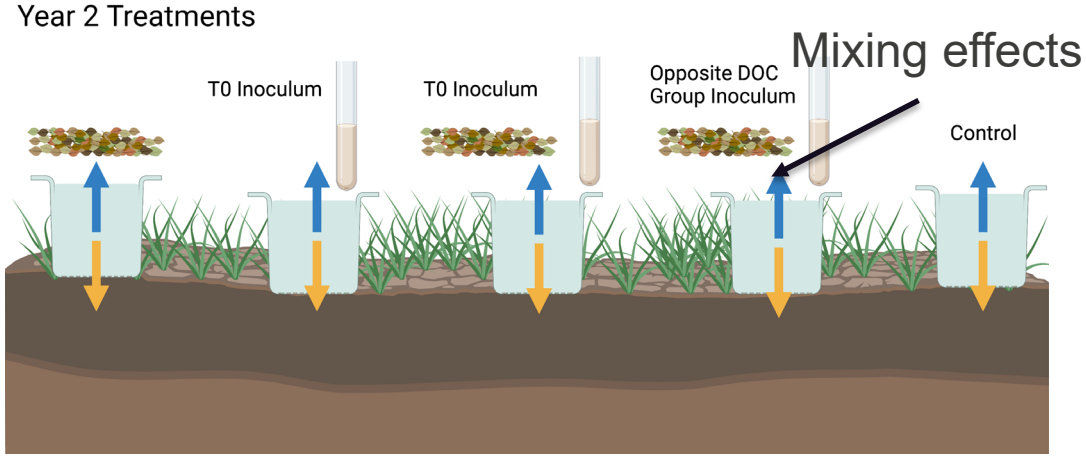
Task 3.1.1



Conduct a **multi-year field experiment** to

- Test if, and how re-inoculations and litter addition will strengthen the microbiome phenotype





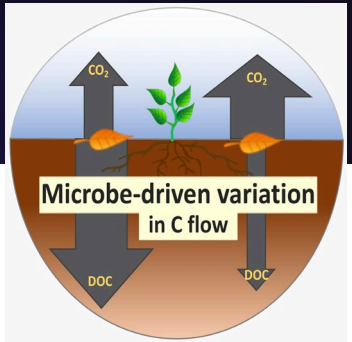
Hypotheses:

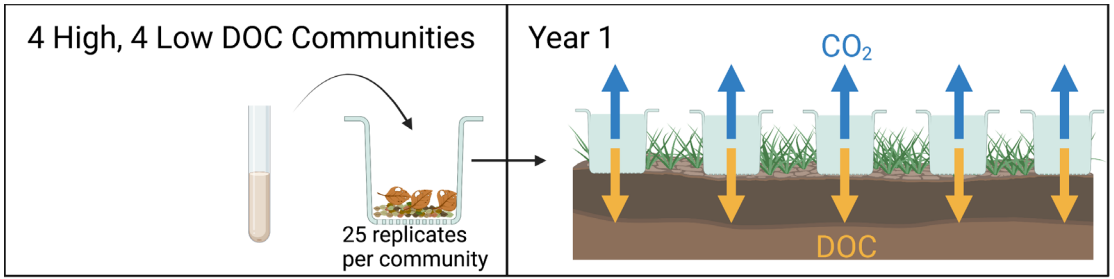
-The C flow pattern created by the initial microbial inoculum will be maintained if new litter and additional microbial inoculum is added to old litter.

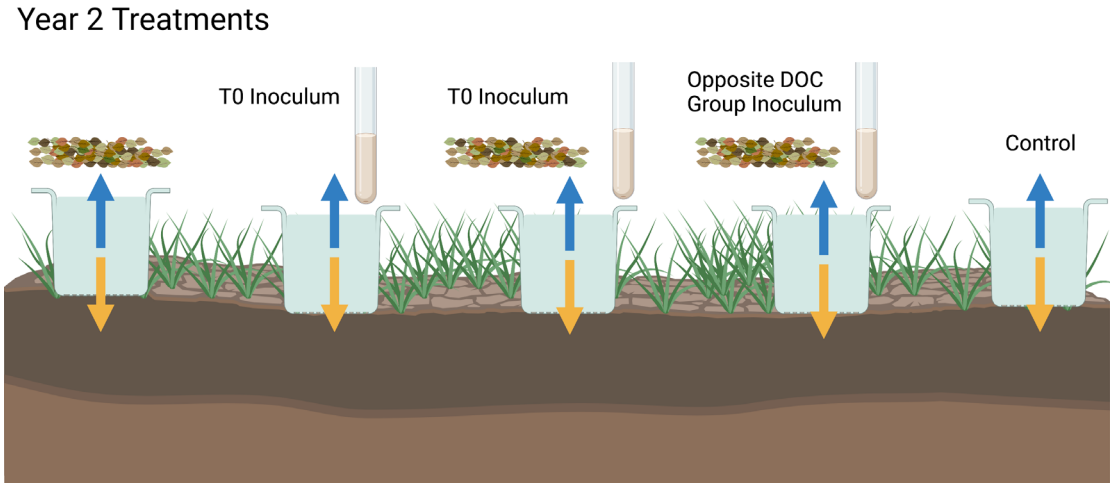
-A new successional pattern will merge when only 'new' litter is added, and the C flow pattern from year one will be maintained.

-High and low DOC phenotypes will react differently to addition of litter only or litter with inoculum.

Measurements

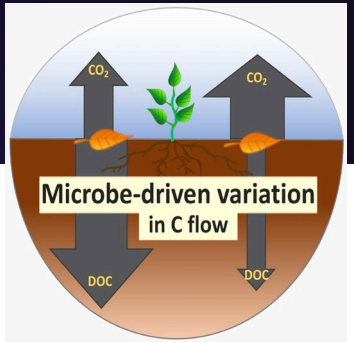






- CO_2 flux
- DOC accumulation
- Community composition (initial and before each re-inoculation)
- Litter mass loss

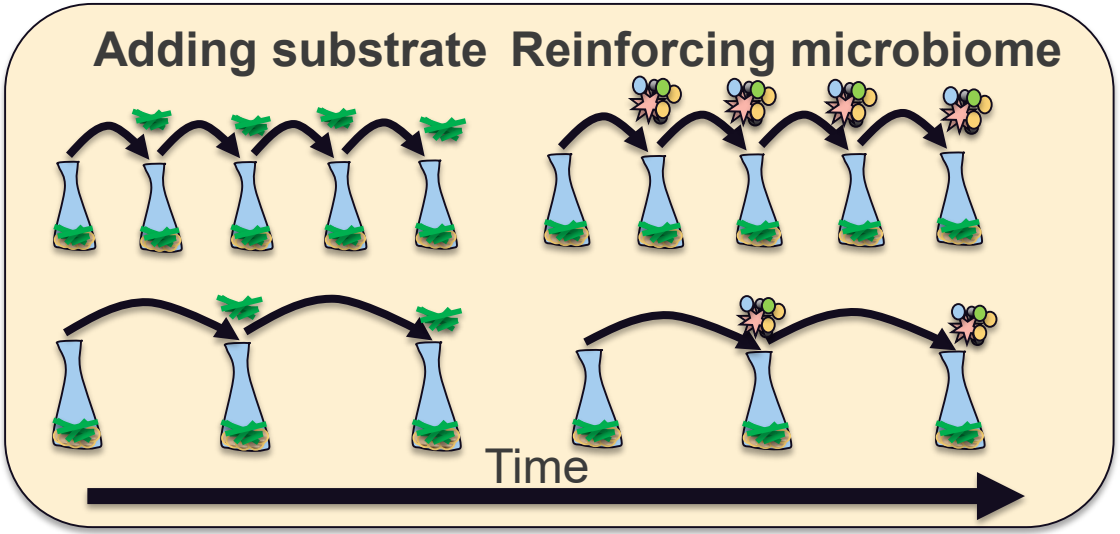
Task 3.1.2



Conduct a multi-year **laboratory experiment**

- Test if, and how, re-inoculations and litter addition will strengthen the microbiome phenotype in **controlled conditions**

- **Goal:** To understand mechanisms that control microbiome phenotype and shed light on how, and at what points during decomposition process the phenotype can be controlled



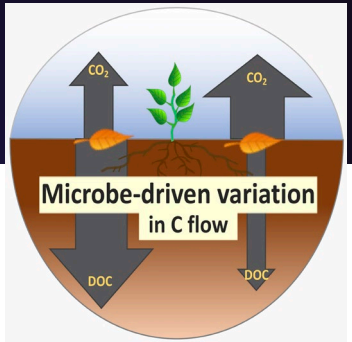
Hypotheses:

-*A higher frequency* of re-inoculation alone will *strengthen* the DOC phenotype.

-*Litter addition alone* will *maintain* the DOC phenotype when added during late-stage decomposition

-*A combination of increased frequency of re-inoculation and early addition of litter* will *strengthen* the DOC phenotype.

Phase V outcome



The ability to predictably alter C flow from surface litter decomposer communities over multi-year time scales in semi-controlled systems